

AUDEN

COUNTY BOROUGH



OF WEST HAM.

PASSMORE EDWARDS MUSEUM.

CATALOGUE OF THE _____



EDUCATIONAL
COLLECTION OF
MINERALS

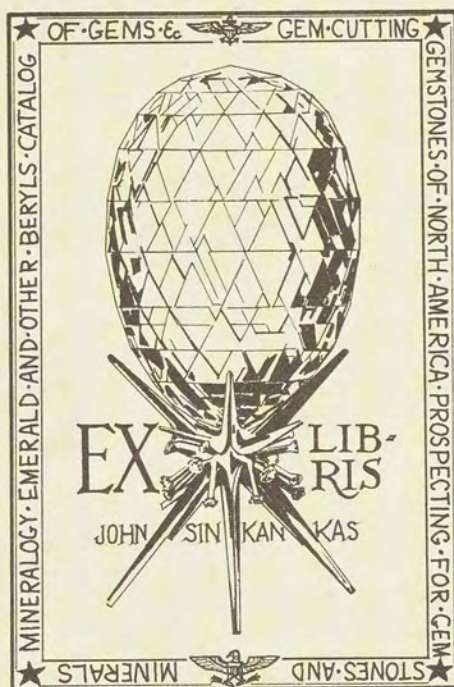
BELONGING TO THE

West Ham Municipal Technical Institute.

COMPILED BY

H. A. AUDEN, D.Sc., M.Sc.,

Head of the Chemical Department.



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[Essex Co., SE Eng.]

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PREFACE.

THIS Catalogue has been compiled by Dr. Auden with a view to illustrate the systematic grouping of mineral specimens.

The collection, being intended for teaching purposes, contains only those minerals which may be considered typical in character.

The special method of printing has been adopted so that the sheets of the Catalogue may be used for labelling purposes ; and for this reason alone, if for no other, it should be of use to mineral collectors.

ALBERT E. BRISCOE,

Principal.

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WEST HAM.

February 7th, 1902.



INTRODUCTION.

In forming the Collection of Minerals included in this catalogue, an attempt has been made to represent typical minerals, and as such this must not be regarded as being complete. It has been arranged in such a manner that it may be largely extended without interfering in any way with the classification. The classification adopted is based on that of Klockmann, and it is hoped may be found clear, comprehensive, and systematic. The question of classification of minerals is a difficult one, as each system has its advantages and defects. The chemical composition of minerals affords the readiest means of grouping them. Two systems of classification present themselves: We may represent the minerals according to the electro-positive or electro-negative constituents. The classification on an electro-positive basis would lead to the grouping together of minerals which, from crystallographic or other reasons, are entirely dissimilar. The alternative method has more in its favour, and has accordingly been made use of in this catalogue.

In the nomenclature the most systematic name has been selected, and in order that minerals bearing other names may be traced these are added under the heading of "Synonyms and Varieties." The second column contains the crystallographic system in which the mineral occurs. In a future catalogue it is hoped to give a short account of the more commonly-occurring crystal forms. In the fourth column reference is made to crystallographic grouping. The asterisk (*) found in this column refers to its utility for industrial purposes. (See Addenda.) Under the heading "Colour" will be found the usual tints met with in specimens of the mineral. The sixth column contains the names of those minerals which are most likely to be confounded with the ore described, owing to similarities of colour or lustre. In the seventh column are given the names of the minerals usually found associated with the particular mineral in question, and thus frequently will enable the mineralogist to find other minerals in its immediate vicinity. The eighth column gives the hardness as expressed in Moh's scale. For references this is appended:—

Talc, 1.	Gypsum, 2.	Calcite, 3.	Fluorspar, 4.	Apatite, 5.
Felspar, 6.	Quartz, 7.	Topas, 8.	Corundum, 9.	Diamond, 10.

The last column contains the specific gravity, an important factor in the mechanical separation of ores from associated rocks; thus the specific gravity of ores lies between 4 and 7·5, but of associated minerals between 2 and 3·5.

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p style="text-align: right;">CLASS A.—</p> <p style="text-align: right;">DIVISION I.—</p>			
1.	DIAMOND. C.	REGULAR.	v. BORT. v. CARBONADO.
2.	GRAPHITE. C.	HEXAGONAL.	s. PLUMBAGO. s. BLACK LEAD.
3.	SULPHUR. S.	RHOMBIC.	s. BRIMSTONE. s. NATIVE SULPHUR. v. SELEN-SULPHUR.
<p style="text-align: right;">DIVISION II.—METALLOIDS</p>			
1.	ARSENIC. As.	HEXAGONAL.	s. NATIVE ARSENIC. s. ARSENICAL BISMUTH, s. HYPOTYPHITE. v. ARSENO-LAMPRITE.
2.	ANTIMONY. Sb.	HEXAGONAL.	v. ALLEMONTITE (As and Sb).
3.	BISMUTH. Bi.	HEXAGONAL.	—

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
ELEMENTS.					
NON-METALS.					
*	Colourless, yellowish brown, grey, green, black, rarely blue.	—	—	10	3.50—3.52
*	Dark or steel grey.	Molybdenite. Arsenic.	In Gneiss, Mica Schists, Granite, Porphyry, Granular Limestone.	1—2	2.2
*	Yellow, orange, brown.	—	Gypsum. Anhydrite. Marl. Limestone. Calcite. Celestine. Aragonite.	1.5—2.5	2.0—2.1
(BRITTLE METALS).					
} Arsenic Group.	Light lead grey, dark grey to black.	—	In Silver and Cobalt Lodes.	3—4	5.7—5.8
	Tin white to grey.	Dyscrasite. Allemontite.	—	3—3.5	6.6—6.7
	Reddish silver white.	Kupfernickel. Linnæite. Danaite. Breithauptite.	Bismuth Glance. Tinstone. Cobalt Ores containing Silver.	2—2.5	9.7—9.8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION III.—
1.	GOLD. Au.	REGULAR.	s. NATIVE GOLD. v. ELECTRUM. v. PORPEZITE.
2.	SILVER. Ag.	REGULAR.	s. NATIVE SILVER.
3.	MERCURY. Hg.	REGULAR.	s. QUICKSILVER.
4.	AMALGAM (Hg, Ag).	REGULAR.	—
5.	COPPER. Cu.	REGULAR.	s. NATIVE COPPER. s. MALLEABLE COPPER.
6.	IRON. Fe (often with Ni).	REGULAR.	—
7.	PLATINUM. Pt.	REGULAR.	s. PLATINA. s. POLYXEN.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
METALS. * * * Gold Group. * *	Yellow—brass yellow and light yellow.	Pyrites. Copper pyrites.	Pyrites. Quartz. Limonite.	2·5—3	15—19·4
	White, yellow, brown, grey.	—	Silver Ores. Galena. Arsenic Ores. Heavy Spar. Calcite. Fluor Spar. Quartz.	2·5—3	10—12
	Tin white.	—	Cinnabar.	—	13·5—13·6
	White.	—	Cinnabar.	3—3·5	13·7—14·1
	Red, brown, black, green, blue.	—	Cuprite. Silver. Calcite. Quartz. Prehnite. Zeolite.	2·5—3	8·5—9
	Steel grey to black.	—	In Meteorites.	4·6—6	7·88
	Steel grey to silver white.	—	Platinum metals.	4—5	14—19

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p style="text-align: right;">CLASS B.—</p> <p style="text-align: right;">DIVISION I.—SULPHIDES,</p>			
1.	REALGAR. As_2S_2 .	MONOCLINIC.	s. RED ARSENIC BLENDE. s. RED ORPIMENT. s. EOLITE. s. RISIGALLO.
2.	ORPIMENT. As_2S_3 .	RHOMBIC.	s. YELLOW ARSENIC BLENDE.
3.	ANTIMONITE. Sb_2S_3 .	RHOMBIC.	s. ANTIMONY GLANCE. s. GREY ANTIMONY ORE. s. STIBNITE. s. STIBINE.
4.	BISMUTHITE. Bi_2S_3 .	RHOMBIC.	s. BISMUTH GLANCE. s. BISMUTHINE. s. BISMUTHOLAMPRITE.
5.	ANTIMONY BLENDE. $2\text{Sb}_2\text{S}_3, \text{Sb}_2\text{O}_3$.	MONOCLINIC.	s. RED ANTIMONY. s. KERMESITE. s. KERMES. s. PYROSTIBITE. s. PYRANTIMONITE.
6.	MOLYBDENITE. MoS_2 .	HEXAGONAL (P)	s. MOLYBDENUM GLANCE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
SULPHIDES. &c., OF THE METALLOIDS. —	Red to yellow.	Cinnabar. Proustite.	Orpiment. Antimonite.	1·5—2	3·4—3·6
* { Isomorphic group of Antimonite. *	Citron yellow.	Antimony ochre.	Realgar. Antimonite.	1·5—2	3·4—3·5
	Lead grey.	Bismuth glance. Galena. Pyrolusite.	Antimony Ores.	2	4·6—4·7
	Lead grey to white.	Antimonite.	Tin Ores. Copper Pyrites.	2	6·4—6·6
—	Cherry red.	—	—	1—1·5	4·5—4·6
—	Lead grey to black.	Graphite.	Cassiterite.	1—1·5	4·7—4·8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—SULPHIDES,
1.	GALENA. PbS.	REGULAR.	s. LEAD GLANCE. s. BLUE LEAD. s. POTTER'S ORE. s. STEINMANNITE. s. GALENITE.
2.	ARGENTITE. Ag ₂ S.	REGULAR.	s. SILVER GLANCE. s. VITREOUS SILVER. s. ARGYRITE. s. ARGYROSE.
3.	COPPER GLANCE. Cu ₂ S.	RHOMBIC.	s. REDRUTHITE. s. CHALCOCITE. s. CHALCOSINE. s. VITREOUS COPPER. s. CUPREINE. s. CYPRITE.
4.	DYSCRASITE. Ag ₂ Sb (P).	RHOMBIC.	s. ANTIMONIAL SILVER. s. STIBIOHEXARGENTITE. s. STIBIOTRIARGENTITE.
5.	CINNABAR. HgS.	HEXAGONAL.	s. MERCURY BLENDE. s. CINNABARITE. v. HEPATIC CINNABAR. v. META-CINNABARITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
&c., OF THE METALS.					
* Galena Series.	Lead grey to dull lead grey.	Antimonite. Ullmanite.	Copper Pyrites. Bournonite. Quartz. Calc Spar. Heavy Spar. Spathic Iron. Zinc Blende. Silver ores. Calamine.	2·5	7·3—7·6
* 	Dark lead grey.	Copper glance.	Silver ores.	2—2·5	7—7·4
* Copper Glance Series.	Dark lead grey.	Silver glance. Bournonite. Magnetite. Chromite. Iron glance. Fahl ore. Red Copper ore.	Cuprite. Malachite. Lapis Lazuli. Variegated Copper ore.	2·5—3	5·5—5·8
* 	Silver grey to black or brown.	Antimony. Silver.	Silver ores. Arsenic and Antimony ores.	3·5	9·4—10
* Cinnabar Series.	Crimson to scarlet. Red brown to grey.	Realgar. Copper bloom. Cuprite. Hæmatite. Rutile.	Mercury. Pyrites. Marcasite. Antimonite. Bitumen.	2—2·5	8—8·2

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—SULPHIDES, &c.,
6.	COVELLINE. CuS.	HEXAGONAL.	s. COVELLITE. s. INDIGO COPPER. s. BREITHAAPTITE (CHAPMAN).
7.	SYLVANITE. AuAgTe ₄ .	MONOCLINIC.	s. AUROTELLURITE. s. GRAPHIC TELLURIUM. s. WHITE TELLURIUM. s. YELLOW TELLURIUM. s. MÜLLERITE. s. AURO-ARGENTIFEROUS TELLURIUM.
8.	NAGYAGITE. (PbAu) (STe) ₂ .	RHOMBIC.	s. BLACK TELLURIUM. s. FOLIATED TELLURIUM. s. TELLURIUM GLANCE. s. ELASMOSE (BEUDANT).
9.	ZINC BLENDE. ZnS (with FeS).	REGULAR.	s. SPHALERITE. s. BLENDE. s. BLACK JACK. v. CLEIOPHANE. v. MARMATITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OF THE METALS — <i>continued.</i>					
{ Cinnabar Series.	Blue black to indigo.	—	Copper glance. Copper Pyrites.	1·5—2	4·6
* { Sylvanite Group.	Steel grey to silver white. Light yellow.	Nagyagite.	Gold.	1·5—2	7·99—8·33
* {	Dark lead grey.	Sylvanite.	Gold. Sylvanite.	1—1·5	6·85—7·20
* { Isomorphic Group of zinc blendes.	Yellow, red, brown, black, green.	Garnet. Galena. Cassiterite. Vesuvianite. Fahl ore.	Galena. Quartz. Calc Spar. Heavy Spar. Fluor Spar. Spathic Iron. Manganese Spar. Pyrites. Copper Pyrites.	3·5—4	3·9—4·2

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—SULPHIDES, &c.,
10.	WURTZITE. ZnS.	HEXAGONAL.	v. ERYTHROZINCITE.
11.	PYRRHOTITE. FeS [Fe ₅ S ₆ to Fe ₁₆ S ₁₇].	HEXAGONAL.	s. MAGNETIC PYRITES. s. PYRRHOTINE.
12.	MILLERITE. NiS.	HEXAGONAL.	s. NICKEL PYRITES. s. CAPILLARY PYRITES. s. TRICHOPYRITE.
13.	KUPFERNICKEL. NiAs.	HEXAGONAL.	s. NICCOLITE. s. NICKELINE. s. RED NICKEL PYRITES. s. ARSENICAL NICKEL.
14.	ANTIMONY NICKEL.	HEXAGONAL.	s. BREITHAUPTITE (DANA).

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
15.	PYRITES. FeS_2	REGULAR.	DIVISION II.—SULPHIDES, &c., s. IRON PYRITES. s. MUNDIC. s. XANTHO-PYRITES. v. BALLESTEROSITE.
16.	COBALT GLANCE CoAsS .	REGULAR.	s. COBALTINE. s. COBALTITE. s. BRIGHT WHITE COBALT.
17.	GERSDORFFITE. NiAsS .	REGULAR.	s. NICKEL GLANCE. s. ARSENICAL NICKEL PYRITES. s. PLESSITE. s. DISOMOSE. v. AMOIBITE.
18.	ULLMANITE. NiSbS .	REGULAR.	s. ANTIMONY NICKEL PYRITES. s. NICKEL BOURNONITE.
19.	SMALTITE. CoAs_2 (with NiAs_2).	REGULAR.	s. SPEISCOBALT. s. SMALTINE. s. ARSENICAL COBALT. s. TIN WHITE COBALT. s. GREY COBALT.

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
20.	CHLOANTHITE. NiAs with FeAs ₂ and CoAs ₂ .	REGULAR.	DIVISION II.—SULPHIDES, &c., s. WHITE NICKEL. s. RAMMELSBERGITE (HAIDINGER).
21.	MARCASITE. FeS ₂ .	RHOMBIC.	s. WHITE IRON PYRITES. s. COCKSCOMB PYRITES. s. CELLULAR PYRITES. v. SPEAR PYRITES.
22.	MISPICKEL. FeAsS.	RHOMBIC.	s. ARSENICAL PYRITES. s. WHITE MUNDIC. s. ARSENICAL IRON. s. ARSENO-PYRITES. v. DANAITE.
23.	LÖLLINGITE. FeAs ₂ .	RHOMBIC.	s. ARSENICAL IRON. s. LEUCOPYRITE. s. ARSENOSIDERITE. s. MOHSINE. s. SÄTERSBERGITE.
24.	LINNÆITE. (Ni, Co) ₃ S ₄ (p). (Co, Ni) ₄ S ₅ .	REGULAR.	s. COBALT PYRITES. s. COBALT NICKEL PYRITES. v. SIEGENITE.
25.	SKUTTERUDITE. CoAs ₃ .	REGULAR.	s. ARSENICAL COBALT PYRITES. s. MODUMITE.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OF THE METALS— <i>continued.</i>					
<div data-bbox="30 497 60 652" style="display: inline-block; vertical-align: middle; font-size: 3em;">}</div> Isomorphic Group of Pyrites.	Tin white to grey.	Smaltite. Ullmanite. Gersdorffite. Mispickel. Löllingite.	Red Nickel pyrites. Heavy spar. Nickel bloom.	5·5	6·4—6·8
<div data-bbox="30 663 60 1481" style="display: inline-block; vertical-align: middle; font-size: 3em;">}</div> Isomorphic Group of Marcasite.	Brass yellow, with greenish shade. Grey to green.	Iron pyrites. Copper pyrites.		6—6·5	4·65—4·88
	Silver white to steel grey.	Löllingite. Chloanthite. Smaltite. Antimony silver.	In Tin lodes. With Cobalt and Nickel minerals in Silver lodes.	5·5—6	6—6·2
	Silver white to grey.	Same as Mispickel.	In Serpentine and Spathic Iron.	5—5·5	7·1—7·4
—	Reddish steel grey to copper red.	Cobalt glance.	Copper pyrites. Spathic Iron.	5·5	4·8—5
—	Steel grey to tin white.	Smaltite.	Cobalt ores.	6	6·48—6·86

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION III.—			
1.	COPPER PYRITES. CuFeS_2 .	TETRAGONAL.	s. CHALCOPYRITES. s. YELLOW COPPER ORE. s. TOWANITE. v. PEACOCK ORE.
2.	BORNITE. Cu_3FeS_3 .	REGULAR.	s. ERUBESCITE. s. VARIEGATED COPPER PYRITES. s. PURPLE COPPER. s. HORSEFLESH ORE. s. PHILLIPSITE (BEUDANT). s. TETRADYMITTE.
3.	ZINCKENITE. PbSb_2S_4 .	RHOMBIC.	s. LEAD ANTIMONY GLANCE.
4.	MIARGYRITE. AgSbS_2 .	MONOCLINIC.	s. SILVER ANTIMONY GLANCE. v. HYPARGYRITE. v. KENNGOTTITE.
5.	JAMESONITE. $\text{Pb}_2\text{Sb}_2\text{S}_5$.	RHOMBIC.	s. PFAFFITE. v. PLUMOSITE.
6.	BOULANGERITE. $\text{Pb}_5\text{Sb}_4\text{S}_{11}$.	RHOMBIC.	v. EMBRITHITE. v. PLUMBOSTIBITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
SULPHO-SALTS.					
* } * } Sulphoferrites.	Brass or gold yellow to black.	Marcasite. Pyrites. Magnetic pyrites. Gold.	Galena, Zinc blende. Fahl ore. Pyrites. Marcasite. Cassiterite. Spathic iron. Barytes. Fluor spar.	3·5—4	4·1—4·3
	Red to brown, variegated.	Magnetic pyrites. Kupfernickel.	Copper pyrites. Copper glance. Zinc blende. Galena.	3	4·9—5·1
* } * } * } Sulpharsenites. Sulphantimonites. Sulphbismuthites.	Dark grey to lead grey.	Antimonite. Jamesonite.	Antimonite. Quartz.	3—3·5	5·3—5·35
	Steel and lead grey to black.	Proustite.	Silver lodes.	2—2·5	5·2—5·4
	Steel to dark lead grey.	Zinckenite. Antimonite.	Galena. Quartz. Bournonite.	2—2·5	5·56—5·8
* }	Dark lead grey.	—	Spathic iron. Galena. Antimonite. Antimony ochre.	2·5—3	6·18

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION III.—
7.	BOURNONITE. CuPbSbS_3 .	RHOMBIC.	s. WHEEL ORE. s. ENDELLIONITE. v. WOLCHITE.
8.	PYRARGYRITE. Ag_3SbS_3 .	HEXAGONAL.	s. ANTIMONY SILVER BLENDE. s. DARK RED SILVER ORE. s. RUBY SILVER. s. RED SILVER. s. ARGYRYTHROSE. s. ÆROSITE.
9.	PROUSTITE. $\text{Ag}_3\text{As}_3\text{S}_3$.	HEXAGONAL.	s. ARSENICAL SILVER BLENDE. s. LIGHT RED SILVER ORE. s. RUBY SILVER. s. RED SILVER.
10.	PYROSTILPNITE. Ag_3SbS_3 .	MONOCLINIC.	s. FIRE BLENDE. s. PYRICHROLITE.
11.	FAHL ORE. 4 $(\text{Cu}_2\text{FeZn})_2 \text{S.As}_2\text{S}_3$. 4 $(\text{Cu}_2\text{Ag}_2\text{FeZn})\text{S.Sb}_2\text{S}_3$. (no lead).	REGULAR.	s. TETRAHEDRITE. s. FAHLITE. s. GREY COPPER ORE. s. SPANIOLITE. s. FREIBERGITE. s. PANABASE.

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION III.—
12.	STEPHANITE. Ag_5SbS_4 .	RHOMBIC.	s. BRITTLE SULPHURET OF SILVER. s. BRITTLE SILVER ORE. s. BLACK SILVER.
13.	POLYBASITE. $(\text{Ag}_2\text{Cu}_2)_9\text{Sb}_2\text{S}_{12}$.	MONOCLINIC.	—
14.	ENARGITE. Cu_3AsS_4 .	RHOMBIC.	s. CLARITE. s. GUAYOCANITE.
15.	STANNITE. $\text{Cu}_2\text{FeSnS}_4$.	REGULAR.	s. STANNINE. s. TIN PYRITES.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
SULPHO-SALTS — <i>continued.</i>					
* } Sulpharsenites. Sulphantimonites. Sulphbismuthites.	Lead grey to black.	Same as Copper glance.	In Silver lodes with other Silver ores.	2—2·5	6·2—6·3
* }	Black.	Same as Copper glance.	Stephanite.	2—2·5	6—6·25
* —	Steel grey to black.	Pyrolusite. Manganite.	In lodes with Copper pyrites.	3	4·36—4·47
—	Steel grey to brass yellow.	Fahl ore. Arsenic pyrites.	In tin lodes with Cassiterite. Copper pyrites.	4	4·3—4·5

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			CLASS C.— DIVISION I.—
1.	ARSENITE. As_2O_3 .	REGULAR.	s. ARSENIC BLOOM. s. ARSENOLITE.
2.	SENARMONTITE. Sb_2O_3 .	REGULAR.	
3.	VALENTINITE. Sb_2O_3 .	RHOMBIC.	s. ANTIMONY BLOOM.
4.	QUARTZ. SiO_2 .	HEXAGONAL.	
5.	QUARTZINE (Microcrystalline). SiO_2 .	TRICLINIC (p).	v. CHALCEDONY. v. JASPER. v. FLINT.
6.	TRIDYMITE. SiO_2 .	RHOMBIC.	

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OXIDES.					
SIMPLE OXIDES.					
* Arsenite-Valentinite Group.	Colourless to white.	Senarmontite.	Arsenic ores. Mispickel. Smaltite.	1·5	3·69—3·72
	Colourless to white or grey.	Anglesite.	Antimony ores.	2—2·5	5·22—5·30
	White to grey.	Cerussite.		2·5—3	5·6
* Quartz Group.	Colourless. Violet = Amethyst. Brown = Smoky quartz. White = Milky quartz. Blue = Sapphire quartz. Green = Prase. Rose = Rose quartz. Brown red = Avanturine. Black = Morion. Yellow = Citrine. Yellow brown.	Cordierite. Apatite. Nepheline. Phenakite. Spinel. Beryl. Topaz. Corundum. Diamond.		7	2·5—2·8
	Yellow to blood red = Cornelian. Green with red patches = Heliotrope. Apple green = Chrysoprase. Variously coloured bands = Agate, Onyx, Sardonyx.			7	2·6
	Colourless, white, yellowish grey.			6·5—7	2·28—2·33

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION I.—SIMPLE
7.	ZIRCON. ZrSiO_4 .	TETRAGONAL.	s. ZIRCONITE. s. HELDBURGITE. s. ENGELHARDITE. v. HYACINTH. v. JARGOON.
8.	RUTILE. TiO_2 .	TETRAGONAL.	s. CRISPITE. s. DICKSBERGITE. v. ILMENORUTILE. v. SAGENITE. v. NIGRINE.
9.	ANATASE. TiO_2 .	TETRAGONAL.	s. OCTAHEDRITE. s. OISANITE (DELAMÉTHÉRIE).
10.	BROOKITE. TiO_2 .	RHOMBIC.	s. JURINITE. v. ARKANSITE.
11.	CASSITERITE. SnO_2 .	TETRAGONAL.	s. TIN STONE. v. STREAM TIN. v. WOOD TIN.
12.	POLIANITE. MnO_2 .	TETRAGONAL.	—
13.	PYROLUSITE. MnO_2 .	AMORPHOUS.	VARIETY OF POLIANITE (p). s. CALVONIGRITE.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OXIDES — <i>continued.</i>					
* Zircon Group. * * *	Generally brown to red; more rarely yellow, greenish grey or colourless.	Vesuvianite. Cassiterite. Hyacinth.	—	7·5	4·4—4·7
	Blood red to brown. Foxy red. Black = Nigrine.	Ilmenite. Wolframite. Zincite.	Ilmenite. Specular iron. Apatite. Quartz. Adularia.	6—6·5	4·2—4·3
	Honey yellow, brown, hyacinth red; rarely colourless.	—	Brookite. Rutile. Ilmenite. Quartz. Adularia.	5·5—6	3·83—3·93
	Red brown; indigo blue to black.	—	Anatase. Rutile. Ilmenite. Quartz. Adularia.	5·5—6	3·8—4·1
	No characteristic colour; generally brown to black.	—	—	6—7	6·8—7
	Light steel grey to black.	Pyrolusite. Manganite.	Other Manganese Minerals.	6—6·5	4·85—5
	Light steel to grey.	Polianite. Manganite.	Manganite. Hausmannite.	2—2·5	—

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION I.—SIMPLE			
14.	PSILOMELANE. MnO ₂ with MnO, BaO, K ₂ O, Al ₂ O ₃ , H ₂ O, SiO ₂ , &c.	AMORPHOUS.	VARIETY OF POLIANITE. s. BLACK HÆMATITE.
15.	WAD.	AMORPHOUS.	VARIETY OF POLIANITE. s. EARTHY COBALT. s. BLACK COBALT. s. BOG MANGANESE. v. ASBOLITE.
16.	BRAUNITE. Mn ₂ O ₃ .	TETRAGONAL.	With 7—15 per cent. SiO ₂ = MARCELIN.
17.	HAUSMANNITE. Mn ₃ O ₄ .	TETRAGONAL.	—
18.	CUPRITE. Cu ₂ O.	REGULAR.	s. RED COPPER ORE. s. RUBY COPPER ORE. s. RUBERITE. v. CHALCOTRICHITE. v. TILE ORE.
19.	PERICLASE. MgO.	REGULAR.	s. MAGNESIA. s. PERICLASITE.

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION I.—SIMPLE
20.	ZINCITE. ZnO.	HEXAGONAL.	s. RED ZINC ORE. s. SPARTALITE.
21.	CORUNDUM. Al_2O_3 .	HEXAGONAL.	s. ADAMANTINE SPAR. s. BARKLYITE. s. SOIMONITE. v. EMERY.
22.	HÆMATITE. Fe_2O_3 .	HEXAGONAL.	s. IRON GLANCE. s. SPECULAR IRON. s. SPECULARITE. s. RED IRONSTONE. s. KIDNEY ORE. s. OLIGISTE IRON.
23.	ILMENITE. $(\text{FeTi})_2\text{O}_3$.	HEXAGONAL.	s. TITANIFEROUS IRON ORE. s. TITANIOFERRITE. s. MOHSITE. s. PARACOLUMBITE. s. PARAILMENITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OXIDES — <i>continued</i> .					
	Blood red to brown.	Rutile.	Franklinite. Willemite. Tephroite. Fowlerite. Garnet.	4—4·5	5·4—5·7
* Corundum Group. *	Colourless, grey. Blue = Sapphire. Red = Ruby. Green = Emerald. Yellow = Oriental Topaz. Violet = Oriental Amethyst.	Emerald. Diamond. Tourmaline. Cordierite. Apatite.	Magnetite. Chlorite.	9	3·9—4
	Grey to black. Red to red brown.	Magnetite. Chromite. Cuprite. Zincite. Cinnabar. Ilmenite. Limonite. Nigrine.	—	5·5—6·5	5·19—5·28
	Black to brown.	Magnetite. Hæmatite. Nigrine.	Rutile. Apatite. Titanite. Miascite.	5—6	4·56—5·2

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION II.—			
1.	STIBLITE. $\text{H}_2\text{Sb}_2\text{O}_5$.	AMORPHOUS.	v. STIBICONITE. s. ANTIMONY OCHRE.
2.	OPAL. $\text{SiO}_2 + \text{aq.}$	AMORPHOUS.	s. COMMON OPAL. s. VIDRITE. v. NOBLE OPAL. v. HYALITE. v. WOOD OPAL. v. CACHOLONG.
3.	BRUCITE. $\text{MgO} \cdot \text{H}_2\text{O}$.	HEXAGONAL.	s. TEXALITE. v. NEMALITE.
4.	DIASPORE. $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$.	RHOMBIC.	—
5.	HYDRARGILLITE (CLEAVELAND). $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$.	MONOCLINIC.	s. GIBBSITE.
6.	BAUXITE. $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$.	AMORPHOUS.	s. BEAUXITE. v. WOCHENITE.
7.	SASSOLITE. $\text{B}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$.	TRICLINIC.	s. SASSOLINE. s. BORIC ACID.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
HYDROXIDES.					
—	Sulphur yellow to rust red.	—	Antimony ores.	1·5	5·3
* —	Milk white, brown, colourless.	Chalcedony.	—	5·5—6·5	2·1—2·3
—	Colourless, white, greenish.	Talc. Gypsum. Mica.	Serpentine. Limestone.	2	2·3
} Goethite Group. * * *	Colourless, yellowish, green, violet, brown,	—	Chlorite. Magnetite. Emery. Dolomite. Margarite.	6	3·3—3·46
	Colourless, white.	Wavellite. Chalcedony.	Natrolite.	2·5—3	2·35—2·39
	White, red, brown.	Clay.	—	1—2	2·4—2·55
	White.	—	Sulphur.	1	1·45

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—
8.	GOETHITE. $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$.	RHOMBIC.	s. CHILEITE (BREITHAUPT). v. PYRRHOSIDERITE.
9.	LIMONITE. $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$.	RHOMBIC (?).	s. BROWN IRONSTONE. s. BROWN HÆMATITE. s. WOOD IRON. s. HYDROSIDERITE. s. STILPNOSIDERITE. v. BOG IRON ORE.
10.	MANGANITE. $\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$.	RHOMBIC.	s. GREY OXIDE OF MANGANESE. s. ACERDÈSE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
HYDROXIDES — <i>continued.</i>					
{ * { Goethite group— <i>continued.</i>	Brown to brownish black.	—	Hæmatite (red and brown).	5—5·5	3·8—4·3
	Red brown to brownish black, ochre yellow.	Hæmatite. Psilomelane.	—	1—5·5	3·4—4
	Black to brown.	Antimonite.	Manganese ores. Heavy spar.	3·5—4	4·3—4·4

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p style="text-align: right;">CLASS D.—</p> <p style="text-align: right;">DIVISION I.—</p>			
1.	SYLVINE. KCl.	REGULAR.	s. SYLVITE. s. HÖVELLITE.
2.	HALITE. NaCl.	REGULAR.	s. COMMON SALT. s. ROCK SALT.
3.	SAL-AMMONIAC. NH ₄ Cl.	REGULAR.	s. SALMIAK.
4.	CHLORARGYRITE. AgCl.	REGULAR.	s. HORN SILVER. s. KERARGYRITE. s. CERARGYRITE. s. KERATE. s. ARGYRO CERATITE.
5.	BROMARGYRITE. AgBr.	REGULAR.	s. BROMITE. s. BROMYRITE. s. BROMIC SILVER.
6.	FLUORITE. CaF ₂ .	REGULAR.	s. FLUOR SPAR. s. FLUOR. s. LIPARITE. v. BLUE JOHN.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	Sp. Gr.
HALOID SALTS.					
SIMPLE CHLORIDES.					
*	Colourless.	—	Halite.	2	1·9—2
*	Colourless, red, yellow, blue, grey, greenish.	—	Gypsum. Anhydrite. Clay. Bitumen.	2	2·1—2·2
	Colourless, yellow. brown.	—	Lava.	1·5—2	1·5—1·6
*	Pearl grey, greenish, yellow, blue, black.	—	—	1—1·5	5·5—5·6
*	Yellow, green, grey.	—	—	1—2	5·8—6
*	Colourless, violet, green, honey yellow.	Barytes. Apatite. Orthoclase.	In Tin and Silver lodes, Crystalline schists, Granular limestones.	4	3·1—3·2

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION II.—DOUBLE			
1.	CRYOLITE. $3\text{NaF}.\text{AlF}_3.$	MONOCLINIC.	s. CHODNEFFITE.
2.	CARNALLITE. $\text{KCl}.\text{MgCl}_2.6\text{H}_2\text{O}.$	RHOMBIC.	—
DIVISION III.—CHLORIDES, &c., in			
1.	KAINITE. $\text{KCl}.\text{MgSO}_4.3\text{H}_2\text{O}.$	MONOCLINIC.	—
2.	PHOSGENITE. $\text{PbCl}_2.\text{PbCO}_3.$	TETRAGONAL.	s. HORN LEAD. s. CROMFORDITE. s. GALENOCERATITE. s. CERASINE.
3.	ATACAMITE. $\text{CuCl}_2.3\text{Cu}(\text{OH})_2.$	RHOMBIC.	s. REMOLINITE. s. HALOCHALCITE. s. SMARAGDOCHALCITE (HAUSMANN).

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	Sp. Gr.
CHLORIDES and FLUORIDES.					
* —	Snow white, red to brown, black.	Anhydrite. Heavy spar.	Spathic iron. Quartz. Pyrites. Galena. Copper pyrites. Tinstone.	2·5—3	2·95—2·97
* —	White, yellow, red, colourless.	—	Anhydrite. Rock salt. Sylvine.	1	1·6
combination with OXIDES and OXYSALTS.					
* —	Colourless, yellow, grey.	—	Halite. Sylvine.	2	2·1
—	White, grey, yellow.	—	Galena.	2·5—3	6·3
* —	Grass green to blackish green.	Malachite. Libethenite. Olivenite.	Cuprite. Limonite.	3—3·5	3·76

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p>CLASS E.—ALUMINATES,</p> <p>DIVISION I.—ALUMINATES</p>			
1.	SPINEL. $\text{MgO} \cdot \text{Al}_2\text{O}_3$.	REGULAR.	v. CHLOROSPINEL (GREEN). v. PLEONASTE (BLACK). v. CEYLONITE (BLACK).
2.	GAHNITE. $\text{ZnO} \cdot \text{Al}_2\text{O}_3$.	REGULAR.	s. ZINC SPINEL. s. AUTOMOLITE. v. KREITTONITE.
3.	FRANKLINITE. $(\text{ZnMn})\text{O} \cdot \text{Fe}_2\text{O}_3$.	REGULAR.	—
4.	CHROMITE. $\text{FeO} \cdot \text{Cr}_2\text{O}_3$.	REGULAR.	s. CHROME IRON ORE. s. CHROMOFERRITE.
5.	MAGNETITE. $\text{FeO} \cdot \text{Fe}_2\text{O}_3$.	REGULAR.	s. MAGNETIC IRON ORE.
6.	CHRYSOBERYL. $\text{BeO} \cdot \text{Al}_2\text{O}_3$.	RHOMBIC.	v. CYMOPHANE. v. ALEXANDRITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	Sp. Gr.
FERRITES, and BORATES.					
and FERRITES.					
* —	Colourless, red, dark red, yellow red, bluish red, green, black.	Zircon. Garnet. Corundum.	—	8	3·5—4·1
—	Blackish green.	—	Franklinite. Zincite. Arsenic ores.	8	4·33—4·35
* —	Black.	Chromite. Magnetite. Copper glance.	Zincite.	6—6·5	5—5·1
—	Black, brown.	Magnetite. Franklinite.	In Serpentine.	5·5	4·4—4·6
* —	Black.	—	—	5·5—6·5	4·9—5·2
* —	Greenish white to emerald green.	Corundum. Spinel.	Spinel. Garnet. Beryl.	8·5	3·65—3·8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION II.—			
1.	BORACITE. $\text{Mg}_7\text{B}_{16}\text{O}_{30}\text{Cl}_2$.	RHOMBIC and REGULAR.	—
DIVISION III.—			
1.	TINCAL. $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$.	MONOCLINIC.	s. BORAX.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
ANHYDROUS BORATES.					
* —	Colourless, blue, green, yellow, grey.	—	Gypsum. Carnallite.	7	2·9—3
BORATES.					
* —	Colourless, grey, yellow, green, brown.	Natron.	Halite. Soda.	2—2·5	1·7—1·8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p style="text-align: right;">CLASS F.—NITRATES,</p> <p style="text-align: right;">DIVISION I.—</p>			
1.	NITRE. KNO_3 .	RHOMBIC.	s. SALTPETRE.
2.	CHILI SALTPETRE. NaNO_3 .	HEXAGONAL.	s. NITRATITE. s. SODA NITRE. s. CALICHE.
<p style="text-align: right;">DIVISION II.—</p>			
1.	CALCITE. CaCO_3 .	HEXAGONAL.	s. CALC SPAR. s. SPARTAITE. s. SLATE SPAR. v. LIMESTONE. v. MARBLE. v. CHALK.
2.	DOLOMITE. $(\text{CaMg})\text{CO}_3$.	HEXAGONAL.	s. BITTER SPAR. s. BROSSITE. s. TERUELITE. v. PEARL SPAR.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
CARBONATES, SELENITES. NITRATES.					
* —	Colourless, white, grey.	Aragonite.	—	2	1·9—2·1
* —	Colourless.	Calc spar.	Halite. Gypsum. Clay. Sand. Guano.	1·5—2	2·1—2·2
ANHYDROUS CARBONATES.					
* } Isomorphic Calcite group.	Colourless and coloured.	Aragonite. Anhydrite. Heavy spar. Dolomite. Gypsum.	—	3	2·6—2·8
	Colourless and coloured.	Calcite.	—	3·5—4	2·9

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—
3.	MAGNESITE. MgCO_3 .	HEXAGONAL.	s. BITTER SPAR. s. GIOBERTITE. s. PINOLITE.
4.	ZINC SPAR. ZnCO_3 .	HEXAGONAL.	s. CALAMINE. s. SMITHSONITE (BEUDANT).
5.	IRON SPAR. FeCO_3 .	HEXAGONAL.	s. CLAY IRONSTONE. s. CHALYBITE. s. SPATHIC IRON. s. SIDERITE. s. JUNCKERITE. v. SPHAEROSIDERITE.
6.	MANGANESE SPAR. MnCO_3 .	HEXAGONAL.	s. RHODOCHROSITE. s. DIALOGITE. s. WISERITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
ANHYDROUS CARBONATES— <i>continued.</i>					
* }	Colourless, white, yellow, brown.	Calcite. Dolomite.	—	4—4·5	2·3—3·1
* }	Colourless, generally yellow, grey, brown, green.	—	Dolomite limestone.	5	4·1—4·5
* { Isomorphic Calcite group— <i>continued.</i>	Yellowish, brown.	—	—	3·5—4·5	3·7—3·9
	Pink, rose red, grey, yellow, brown, rarely colourless.	—	Quartz.	3·5—4·5	3·3—3·6

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—
7.	ARAGONITE. CaCO_3 .	RHOMBIC.	s. CHIMBORAZITE. s. IGLITE. s. IGLOITE. v. FLOS FERRI. v. TARNOVICITE. v. MOSSOTITE.
8.	WITHERITE. BaCO_3 .	RHOMBIC.	s. BAROLITE.
9.	STRONTIANITE. SrCO_3 .	RHOMBIC.	—
10.	CERUSSITE. PbCO_3 .	RHOMBIC.	s. WHITE LEAD ORE. s. LEAD SPAR.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
ANHYDROUS CARBONATES— <i>continued.</i>					
* { Isomorphic Aragonite group. * * *	Colourless, light yellow, brown, blue, grey, black.	Calcite. Natrolite. Strontianite. Celestine. Heavy spar.	—	3·5—4	2·9—3
	White, grey, colourless.	Cerussite. Quartz.	Galena.	3—3·5	4·2—4·3
	Colourless, white, grey, green.	Aragonite. Calcite. Natrolite. Celestine. Heavy spar.	Heavy spar.	3·5	3·6—3·8
	Colourless, white, grey, yellow.	Anglesite. Scheelite. Heavy spar. Celestine.	Galena.	3—3·5	6·4—6·6

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION III.—
1.	SODA. $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$.	MONOCLINIC.	s. NATRON.
2.	ZINC BLOOM. $\text{ZnCO}_3 \cdot 2\text{Zn}(\text{OH})_2$.	?	s. HYDROZINCITE. s. EARTHY CALAMINE. s. ZINCONINE. s. MARIONITE.
3.	MALACHITE. $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$.	MONOCLINIC.	s. GREEN CARBONATE OF COPPER.
4.	AZURITE. $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$.	MONOCLINIC.	s. CHESSYLITE. s. BLUE CARBONATE OF COPPER. s. BLUE COPPER.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
CARBONATES.	—	Tincal.	—	1—1·5	1·4—1·5
	Colourless.				
* —	Snow white, pale yellow.	—	Calamine.	2—2·5	3·25
* —	Dark green to emerald.	Phosphorochalcite. Atacamite. Libethenite. Olivenite.	Copper ores. Brown hæmatite.	3·5—4	3·7—4·1
* —	—	Linarite. Vivianite. Lapis lazuli.	Same as Malachite.	3·5—4	3·7—3·8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p>CLASS G.—SULPHATES, CHROMATES,</p> <p>DIVISION I.—</p>			
1.	GLAUBERITE. $\text{Na}_2\text{SO}_4 \cdot \text{CaSO}_4$.	MONOCLINIC.	s. BROGNIARTINE.
2.	ANHYDRITE. CaSO_4 .	RHOMBIC.	s. KARSTENITE. s. MURIACITE.
3.	HEAVY SPAR. BaSO_4 .	RHOMBIC.	s. BARYTES. s. BARYTINE. s. CAWK. s. MICHEL-LÉVYTE. s. BAROSELENITE. s. EGGONITE.
4.	CELESTINE. SrSO_4 .	RHOMBIC.	s. CELESTITE.
5.	ANGLESITE. PbSO_4 .	RHOMBIC.	s. LEAD VITRIOL. s. SARDINIAN.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
MOLYBDATES, TUNGSTATES, URANATES. ANHYDROUS SULPHATES.					
* —	Colourless, white, grey, yellow, red.	—	Halite.	2·5—3	2·7—2·8
* * * * } Isomorphic heavy spar group.	Colourless, white, blue, red, black.	Cryolite. Gypsum. Heavy spar. Limestone.	Gypsum. Halite.	3—3·5	2·8—3
	Colourless, white, yellow, pink, blue, brown, grey.	Celestine. Aragonite. Calcite.	—	3—3·5	4·3—4·7
	Colourless, often blue, yellow, white.	Heavy spar. Aragonite. Calcite.	Sulphur. Marl. Gypsum. Calcite.	3—3·5	3·9—4
	Colourless, grey, yellow, green, blue.	Cerussite. Heavy spar. Scheelite.	Galena. Brown hæmatite.	3	6·12—6·35

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION II.—
1.	MIRABILITE. $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$.	MONOCLINIC.	s. GLAUBER SALT. s. EXANTHALITE. s. REUSSIN.
2.	GYPSUM. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.	MONOCLINIC.	v. FIBROUS GYPSUM. v. SATIN SPAR. v. ALABASTER. v. SELENITE.
3.	KIESERITE. $\text{Na}_2\text{SO}_4 \cdot \text{H}_2\text{O}$.	MONOCLINIC.	v. MARTINSITE (KENNGOTT).
4.	POLYHALITE. $\text{K}_2\text{SO}_4 \cdot \text{MgSO}_4 \cdot 2\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.	MONOCLINIC or RHOMBIC.	—
5.	ALUNITE. $3(\text{Al}_2\text{O}_3 \cdot \text{SO}_3) \cdot \text{K}_2\text{O} \cdot \text{SO}_3 \cdot 6\text{H}_2\text{O}$.	HEXAGONAL.	s. ALUM STONE. s. ALUMINILITE.
6.	POTASH ALUM. $\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$.	REGULAR.	s. ALUM. s. KALINITE.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
SULPHATES.					
—	Colourless, white.	—	Halite.	1·5—2	1·4—1·5
—	Colourless, white, grey, yellow, brown, pink, black.	Anhydrite. Heavy spar. Mica.	Anhydrite. Halite. Clay. Bitumen.	1·5—2	2·2—2·4
—	Colourless, yellow, white.	—	Halite. Sylvine.	3	2·57
—	Pink, red, white, yellow, grey.	—	Halite. Sylvine.	3·35	2·72—2·77
* } Alumo-sulphates.	Colourless.	—	In Trachyte.	3·5—4	2·6—2·8
	Colourless.	—	Lava. Alum shale.	2—2·5	1·7—1·9

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION II.—			
7.	EPSOMITE. $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$.	RHOMBIC.	s. BITTER SALT. s. EPSOM SALT.
8.	BLUE VITRIOL. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.	TRICLINIC.	s. COPPER VITRIOL. s. BLUE STONE. s. CHALCANTHITE. s. CYANOSITE.
9.	LINARITE. $\text{PbSO}_4 \cdot \text{CuO} \cdot \text{H}_2\text{O}$.	MONOCLINIC.	s. CUPREOUS SULPHATE OF LEAD. s. CUPREOUS ANGLESITE.
DIVISION III.—			
1.	CROCOITE. PbCrO_4 .	MONOCLINIC.	s. CHROME LEAD ORE. s. RED LEAD ORE. s. CROCOISITE. s. LEHMANITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
SULPHATES — <i>continued</i> .					
* } Vitriols.	Colourless.	—	Kieserite.	2·25	1·7—1·8
	Blue.	—	Copper pyrites.	2·5	2·2—2·3
—	Azure Blue.	—	—	2·5—3	5·3—5·45
CHROMATES.					
—	Yellow red.	Realgar. Cinnabar.	Galena.	2·5—3	5·9—6

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION IV.—			
1.	SCHEELITE. CaWO_4 .	TETRAGONAL.	s. TUNGSTEN. v. CUPRO-SCHEELITE.
2.	WULFENITE. PbMoO_4 .	TETRAGONAL.	s. YELLOW LEAD ORE. s. MELINOSE.
3.	WOLFRAMITE. $(\text{FeMn})\text{WO}_4$.	MONOCLINIC.	s. WOLFRAM.
DIVISION V.—			
1.	PITCHBLENDE. $(\text{UPb}_2)_3\text{U}_2\text{O}_{12}$.	REGULAR.	s. URANIUM PITCHBLENDE. s. URANINITE. s. NASTURANE. s. URANONIOBITE. s. URANATEMNITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
TUNGSTATES and MOLYBDATES. } Scheelite series.	Grey-white to yellow or brown.	Anglesite. Cerussite. Heavy spar.	Wolframite. Cassiterite. Galena. Brown hæmatite. Magnetite.	4·5—5	5·9—6·2
	Honey yellow, grey, red.	—	Galena.	3	6·3—6·9
—	Black to brown.	—	Tin ores.	5—5·5	7·14—7·54
URANATES. —	Black to greenish brown.	—	Galena. Silver minerals. In granite.	3—6	5—9

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p>CLASS H.— NIOBATES, TANTALATES, PHOSPHATES,</p> <p>DIVISION I.—</p>			
1.	<p>MONAZITE.</p> <p>$(\text{CeLa})\text{PO}_4$.</p>	MONOCLINIC.	<p>s. EDWARDSITE.</p> <p>s. EMERITE.</p> <p>v. MONAZITOID.</p>
<p>DIVISION II.—PHOSPHATES,</p>			
1.	<p>APATITE.</p> <p>$\text{FCa}_5(\text{PO}_4)_3$ or</p> <p>$\text{ClCa}_5(\text{PO}_4)_3$.</p>	HEXAGONAL.	<p>s. ASPARAGUS STONE.</p> <p>s. FLUOR APATITE.</p> <p>s. AGUSTITE.</p> <p>v. PHOSPHORITE.</p> <p>v. OSTEOLITE.</p> <p>v. STAFFELITE.</p>
2.	<p>PYROMORPHITE.</p> <p>$\text{ClPb}_5(\text{PO}_4)_3$.</p>	HEXAGONAL.	<p>s. POLYCHROM.</p> <p>v. CHEROPINE.</p>
3.	<p>MIMETESITE.</p> <p>$\text{ClPb}_5(\text{AsO}_4)_3$.</p>	HEXAGONAL.	<p>s. MIMETITE.</p> <p>s. MIMETESE.</p> <p>s. MIMETENE.</p> <p>v. CAMPYLITE.</p>

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
ARSENATES, ANTIMONATES, VANADATES.					
ANHYDROUS PHOSPHATES, &c.					
—	Red, brown.	—	Thorite. In granite.	5—5·5	4·9—5·3
containing CHLORINE or FLUORINE.					
* * { Isomorphic group of Apatite. *	Colourless, green, blue, violet, red.	Quartz. Nepheline. Beryl. Felspar. Calamine.	—	5	3·16—3·22
	Green, brown, orange, colourless.	Mimetesite.	Galena.	3·5—4	6·9—7
	Light yellow, white, colourless.	Pyromorphite.	Galena.	3·5—4	7·1—7·3

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION III.—HYDRATED
1.	STRUVITE. $(\text{NH}_4)\text{MgPO}_4 \cdot 6\text{H}_2\text{O}.$	RHOMBIC.	s. GUANITE.
2.	PHARMACOLITE. $\text{Ca}_2\text{As}_2\text{O}_7 \cdot 5\text{H}_2\text{O}.$	MONOCLINIC.	
3.	VIVIANITE. $\text{Fe}_3\text{P}_2\text{O}_8 \cdot 8\text{H}_2\text{O}.$	MONOCLINIC.	s. BLUE IRON ORE. s. GLAUCOSIDERITE. s. ANGLARITE.
4.	COBALT BLOOM. $\text{Co}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}.$	MONOCLINIC.	s. ERYTHRINE. s. ERYTHRITE. s. EARTHY COBALT BLOOM.
5.	NICKEL BLOOM. $\text{Ni}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}.$	MONOCLINIC.	s. ANNABERGITE. s. NICKEL GREEN. s. NICKEL OCHRE.
6.	WAVELLITE. $3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 12\text{H}_2\text{O}.$	RHOMBIC.	s. DEVONITE. s. STRIEGISANE. s. HYDRARGILLITE (DAVY). v. LASIONITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
PHOSPHATES and ARSENATES.					
—	Yellow to brown.	—	Guano.	1·5—2	1·66—1·75
—	White.	—	Arsenic ores.	2	2·7
} Isomorphic group of Vivianite.	White, colourless, blue.	Azurite. Linarite. Hauyn.	Brown hæmatite. Pyrites. Magnetite.	2	2·6—2·7
	Cherry red, green, grey.	—	Cobalt ores.	2·5	2·948
	Apple green.	—	Chloanthite.	2—2·5	3—3·1
—	Colourless, grey, yellow, green, brown, blue.	Natrolite. Kraurite.	Granite. Brown hæmatite.	3·5—4	2·3—2·4

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION III.—HYDRATED
7	CALAITE. $2\text{Al}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 5\text{H}_2\text{O}.$	AMORPHOUS.	s. TURQUOISE. s. JOHNITE.
8	KRAURITE. $2\text{Fe}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 3\text{H}_2\text{O}.$	RHOMBIC.	s. GREEN IRON ORE. s. DUFRENITE.
9	CACOXENITE. $2\text{Fe}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 12\text{H}_2\text{O}.$	p	s. CACOXENE.
10	LIBETHENITE. $4\text{CuO} \cdot \text{P}_2\text{O}_5 \cdot \text{H}_2\text{O}.$	RHOMBIC.	s. APHÉRÈSE.
11	OLIVENITE. $4\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot \text{H}_2\text{O}.$	RHOMBIC.	s. WOOD ARSENIATE OF COPPER. s. WOOD COPPER. s. PHARMACOCALCITE.
12	PHOSPHOROCALCITE. $6\text{CuO} \cdot \text{P}_2\text{O}_5 \cdot 3\text{H}_2\text{O}.$	p	s. LUNNITE. s. PSEUDOMALACHITE. s. DIHYDRITE. s. PSEUDOLIBETHENITE. s. EHLITE. s. PHOSPHOCALCITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
PHOSPHATES and ARSENATES — <i>continued.</i>					
—	Blue, apple green.	—	—	6	2·6—2·8
—	Dark green.	—	Brown hæmatite.	3·5—4	3·3—3·5
—	Yellow to brown	—	Brown hæmatite.	?	2·3—2·4
} Isomorphic group of Libethenite.	Olive green.	Malachite. Phosphorochalcite. Olivenite. Atacamite.	Mica schists.	4	3·6—3·8
	Olive green, brown, yellow.	Libethenite.	Copper ores.	3	4·2—4·6
—	Green.	Malachite. Libethenite. Olivenite.	Cuprite. Azurite. Malachite. Chalcedony. Brown hæmatite.	4—5	3·4—4·2

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION III.—HYDRATED			
13.	CHALCOPHYLLITE. $8\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 12\text{H}_2\text{O}.$	HEXAGONAL.	s. COPPER MICA. s. TAMARITE.
14.	CALCO-URANIUM MICA. $\text{CaO} \cdot 2(\text{UO}_2) \cdot \text{O} \cdot \text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}.$	RHOMBIC.	s. AUTUNITE. s. CALCOURANITE. s. LIME-URANITE.
15.	CHALCOLITE. $\text{CuO} \cdot 2(\text{UO}_2) \cdot \text{O} \cdot \text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}.$	TETRAGONAL.	s. TOBERNITE. s. COPPER URANIUM MICA. s. URANITE. s. URANOPHYLLITE. s. CUPRO-URANITE.
16.	ZEUNERITE. $\text{CuO} \cdot 2(\text{UO}_2) \cdot \text{O} \cdot \text{As}_2\text{O}_5 \cdot 8\text{H}_2\text{O}.$	TETRAGONAL.	
DIVISION IV.—PHOSPHATES			
1.	PITTIZITE. Fe_2O_3 with phosphate, arsenate, and $\text{SO}_3.$	AMORPHOUS.	s. PITTICITE. s. SIDERETINE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
PHOSPHATES and ARSENATES — <i>continued</i> .					
—	Blue to emerald green.	—	Copper pyrites. Cuprite.	2	2·4—2·6
—	Sulphur yellow.	Chalcophyllite.	Brown hæmatite.	1—2	3·2
—	Grass green.	Calco-uranium mica. Zeunerite. Chalcophyllite.	Brown hæmatite.	2—2·5	3·5—3·6
—	Grass green.	Chalcolite.	Pitchblende.	2·5	3·5
and ARSENATES, containing SO₃.					
—	Brown.	—	Arsenical pyrites.	3	2

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p style="text-align: right;">CLASS K.—SILICATES,</p> <p style="text-align: right;">DIVISION I.—</p>			
1.	<p>ANDALUSITE.</p> <p>Al_2SiO_5.</p>	RHOMBIC.	<p>s. MICA-PHYLLITE.</p> <p>s. STANZAITE.</p> <p>v. CHIASTOLITE.</p>
2.	<p>SILLIMANITE.</p> <p>Al_2SiO_5.</p>	RHOMBIC.	<p>s. GLANCE SPAR.</p> <p>v. FIBROLITE.</p>
3.	<p>DISTHENE.</p> <p>Al_2SiO_5.</p>	TRICLINIC.	<p>s. KYANITE.</p> <p>s. CYANITE.</p>
4.	<p>TOPAZ.</p> <p>$\text{Al}_2(\text{F.OH})_2\text{SiO}_4$.</p>	RHOMBIC.	<p>v. PYCNITE.</p> <p>v. PYROPHYSALITE.</p>
5.	<p>STAUROLITE.</p> <p>$\text{H}_2\text{Fe}_2\text{Al}_{10}\text{Si}_4\text{O}_{26}$.</p>	RHOMBIC.	<p>s. CROSS-STONE.</p> <p>s. STAUROTIDE.</p> <p>s. XANTHOLITE (HEDDLE).</p> <p>s. GRENATITE.</p>

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	Sp. Gr.
TITANATES, ZIRCONATES, STANNATES.					
ANDALUSITE=TOPAZ GROUP.					
Trimorphic Group.	Red to grey.	Tourmaline.	In Gneiss. Sillimanite.	7—7·5	3·1—3·2
	Grey to brown.	Disthene.	In Gneiss and Mica schists.	6—7	3·23—3·24
	Blue, green, grey, colourless.	Sillimanite.	In schists with Staurolite.	4·5—6	3·5—3·7
* —	Colourless and yellow.	—	In Granites and Porphyries.	8	3·4—3·6
—	Red to brown.	Garnet.	In Gneiss.	7—7·5	3·4—3·8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION II.—			
1.	DATOLITE. $\text{H}_2\text{Ca}_2\text{B}_2\text{Si}_2\text{O}_{10}$.	MONOCLINIC.	s. HUMBOLDTITE. s. DATHOLITE. v. BOTRYOLITE.
2.	GADOLINITE. $\text{Fe}_2\text{Be}_2\text{Y}_2\text{Si}_2\text{O}_{10}$.	MONOCLINIC.	s. YTTERBITE.
DIVISION III.—			
1.	TOURMALINE. Aluminium boro-silicate of Li, Mg, Fe.	HEXAGONAL.	v. SCHORL. v. RUBELLITE. v. INDICOLITE. v. ACHROITE. v. APHRIZITE.
2.	AXINITE. $\text{H}(\text{CaFeMn})_3\text{Al}_2\text{BSi}_4\text{O}_{16}$	TRICLINIC.	s. THUMITE. s. YANOLITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
DATOLITE-GADOLINITE GROUP.					
—	Colourless or greenish.	—	Eruptive rocks.	5—5·5	2·9—3
—	Black.	—	In Granite.	6·5	4—4·5
TOURMALINE GROUP.					
—	Black, blue, red, colourless.	Epidote. Augite. Hornblende. Lievrite. Emerald.	In Granite. Gneiss. Granulite.	7—7·5	3—3·2
—	Brown to blue.	—	Diabase. Granite.	6·5—7	3·3

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION IV.—			
1.	ZOISITE. $H_2Ca_4Al_6Si_6O_{26}$.	RHOMBIC.	s. ILLUDERITE. s. SAUALPITE. v. THULITE (ROSE RED).
2.	EPIDOTE. $H_2Ca_4(AlFe)_6Si_6O_{26}$.	MONOCLINIC.	s. PISTACITE s. ACHMATITE. v. SCORZA.
3.	ORTHITE. $H_2(CaFe)_4(AlCl)_6Si_6O_{26}$.	MONOCLINIC.	v. ALLANITE. v. TAUTOLITE. v. URALORTHITE.
4.	VESUVIAN. $(HOF)Ca_6Al_3Si_5O_{21}$.	TETRAGONAL.	s. VESUVIANITE. s. IDOCRASE. v. EGERANE
DIVISION V.—			
1.	GROSSULAR. $Ca_3Al_2Si_3O_{12}$.	REGULAR.	s. ROSE GARNET. v. HESSONITE. v. CINNAMON STONE. v. SUCCINITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	Sp. Gr.
ZOISITE-EPIDOTE GROUP.					
—	Grey, yellow, rose red.	Tremolite.	Hornblende.	6	3·25—3·26
} Isomorphic	Green.	—	—	6—7	3·32—3·49
	Black.	Gadolinite.	In Granites.	5·5	3—4
—	Brown.	Zircon. Garnet. Cassiterite.	—	6·5	3·34—3·45
GARNET GROUP.					
—	Brown, red, colourless, green.	Vesuvian. Zinc blende.	—	6·5—7·5	3·4—4·3

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION V.—			
2.	PYROPE. $\text{Mg}_3\text{Al}_2\text{Si}_3\text{O}_{12}$.	REGULAR.	s. BOHEMIAN GARNET.
3.	SPESSARTINE. $\text{Mn}_3\text{Al}_2\text{Si}_3\text{O}_{12}$	REGULAR.	s. SPESSARTITE. s. MANGANESE GARNET.
4.	ALMANDINE. $\text{Fe}_3\text{Al}_2\text{Si}_3\text{O}_{12}$.	REGULAR.	s. PRECIOUS GARNET. s. COMMON GARNET.
5.	APLOME. $\text{Ca}_3\text{Fe}_2\text{Si}_3\text{O}_{12}$	REGULAR.	v. ANDRADITE.
6.	UWAROWITE. $\text{Ca}_3\text{Cr}_2\text{Si}_3\text{O}_{12}$.	REGULAR.	—
DIVISION VI.—			
1.	CORDIERITE. $\text{H}_2(\text{MgFe})_4\text{Al}_8\text{Si}_{10}\text{O}_{37}$.	RHOMBIC.	s. POLYCHROITE. s. DICHROITE. s. IOLITE. v. PELIOME. v. STEINHEILITE.
2.	BERYL. $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$.	HEXAGONAL.	v. EMERALD (GREEN). v. AQUAMARINE (BLUE). v. DAVIDSONITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
GARNET GROUP — <i>continued.</i>					
—	Blood red.	—	In Serpentine.	6·5—7·5	3·4—4·3
—	—	—	—		
—	—	—	—		
—	—	—	—		
—	Green.	—	—		
CORDIERITE GROUP.					
—	Grey, yellow, blue.	Quartz. Elacolite.	In Gneiss and Granite.	7—7·5	2·6
* —	Colourless, white, green, blue.	Corundum. Chrysoberyl.	Chrysoberyl.	7·5—8	2·67—2·76

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION VII.—			
1.	OLIVINE. $(\text{MgFe})_2\text{SiO}_4$.	RHOMBIC.	s. PERIDOT. v. CHRYSOLITE. v. HYALOSIDERITE.
DIVISION VIII.—			
1.	CALAMINE. $\text{H}_2\text{Zn}_2\text{SiO}_5$	RHOMBIC.	s. SMITHSONITE. s. HEMIMORPHITE. s. ELECTRIC CALAMINE.
2.	DIOPTASE. H_2CuSiO_4	HEXAGONAL.	s. ACHIRITE. s. COPPER EMERALD. s. SMARAGDOCHALCITE (MOHS).
DIVISION IX.—			
1.	CHONDRODITE. $\text{H}_2(\text{MgFe})_{19}\text{Si}_8\text{O}_{34}\text{F}_4$.	MONOCLINIC.	s. BRUCITE (GIBBS).
2.	LIEVRITE. $\text{H}_2\text{Ca}_2\text{Fe}_4 + \text{Fe}_2\text{Si}_4\text{O}_{18}$.	RHOMBIC.	v. ILVAITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OLIVINE GROUP.					
—	Olive green, yellow, brown.	—	In Basalt.	6·5—7	3·3
WILLEMITE GROUP.					
* —	Colourless to yellow.	—	Zinc spar.	5	3·3—3·5
—	Emerald green.	—	Calcite.	5	3·3
HUMITE GROUP.					
—	Yellow to brown.	Humite.	—	6—6·5	3·12—3·24
—	Green black.	—	—	5·5—6	3·9—4·1

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION X.—AUGITE			
1.	ENSTATITE. MgSiO_3 .	RHOMBIC.	v. CHLADNITE. v. SCHILLER SPAR.
2.	BRONZITE. $(\text{MgFe})\text{SiO}_3$.	RHOMBIC.	—
3.	HYPERSTHENE. $(\text{FeMg})\text{SiO}_3$.	RHOMBIC.	s. LABRADOR HORNBLLENDE. s. PAULITE.
4.	WOLLASTONITE. CaSiO_3 .	MONOCLINIC.	s. TABULAR SPAR. s. GRAMMITE. s. VILNITE.
5.	DIOPSIDE. $\text{CaMgSi}_2\text{O}_6$.	MONOCLINIC.	s. PYRGOM. v. ALALITE.
6.	DIALLAGES. $\text{CaMgSi}_2\text{O}_6$ with Al_2O_3 .	MONOCLINIC.	s. GERMARITE. s. VANADIN-BRONZITE.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
and HORNBLENDE GROUP.					
Rhombic Augites.	Grey to green.	—	Apatite. Phlogopite.	5·5	3·1—3·2
	Brown and green.	—	—	5·5	3·2—3·3
	Black.	Diallage.	—	6	3·3—3·4
Monoclinic Augites.	White, yellow, red.	—	—	4·5—5	2·8—2·9
	Green, colourless, grey.	—	Clinocllore. Garnet.	5—6	3·3
	Grey-green to brown.	Bronzite. Hypersthene.	—	4	3·23—3·24

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES
			DIVISION X.—AUGITE
7.	AUGITE. $(\text{FeMg})\text{CaSi}_2\text{O}_6$. $(\text{FeMg})\text{Al}_2\text{SiO}_6$.	MONOCLINIC.	s. PYROXENE. s. PICROPHYLL. s. PORRICINE. s. EUCHYSIDERITE. v. FASSAITE (GREEN).
8.	ACMITE. $\text{NaFeSi}_2\text{O}_6$.	MONOCLINIC.	s. ACHMITE. s. NATROSIDERITE.
9.	RHODONITE. MnSiO_3 .	TRICLINIC.	s. HYDROPITE. s. HETEROCLINE. v. PAISBERGITE.
10.	ANTHOPHYLLITE. $(\text{MgFe})\text{SiO}_3$.	RHOMBIC.	s. ANTHOLITE.
11.	TREMOLITE. $\text{CaMg}_3\text{Si}_4\text{O}_{12}$.	MONOCLINIC.	s. GRAMMATITE. s. CALAMITE. v. NORDENSKJOLDITE.
12.	ACTINOLITE. $\text{Ca}(\text{FeMg})_3\text{Si}_4\text{O}_{12}$.	MONOCLINIC.	s. ACTINOTE. s. ZILLERTHITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
AND HORNBLENDE	GROUP— <i>continued.</i>				
} Monoclinic Augites— <i>continued.</i>	Black.	Hornblende. Tourmaline.	Diabase. Melaphyre. Basalt.	6	3·3—3·5
	Brown to greenish black.	Aegirine.	Granite.	6—6·5	3·4—3·5
Triclinic Augite.	Rose, grey, brown.	Manganese spar.	Manganese spar. Quartz.	5·5—6·5	3·4—3·68
Rhombic Hornblende.	Brown to yellow, grey.	Bronzite. Hypersthene.	—	5·5	3·2
} Monoclinic Hornblendes.	White to grey.	Kyanite.	—	5·6	2·9—3
	Green to grey.	Epidote.	—	5·5—6	2·9—3

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION X.—AUGITE			
13.	HORNBLENDE. $\text{Ca}(\text{FeMg})_3\text{Si}_4\text{O}_{12}$. $(\text{FeMg})_2(\text{AlFe})_4\text{Si}_2\text{O}_{12}$.	MONOCLINIC.	s. AMPHIBOLE. s. WALLERIAN. s. XIPHONITE. s. BASALTINE. v. PARGASITE (BLUE GREEN).
DIVISION XI.—			
1.	SCAPOLITE. $\text{Na}_4\text{Al}_3\text{Si}_9\text{O}_{24}\text{Cl}$. $\text{Ca}_4\text{Al}_6\text{Si}_6\text{O}_{25}$.	TETRAGONAL.	s. WERNERITE. s. CHELMSFORDITE. s. ARCTICITE. s. RAPIDOLITE. s. MARIALITE. s. MEIONITE.
2.	MELILITE. $(\text{CaMg})_7(\text{AlFe})_2\text{Si}_5\text{O}_{20}$.	TETRAGONAL.	v. HUMBOLDTILITE. v. SOMERVILLITE (BROOK).

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
AND HORNBLLENDE	GROUP—continued.				
Monoclinic Hornblendes —continued.	Green, black.	Augite. Tourmaline.	—	5·6	3·1—3·3
SCAPOLITE GROUP.					
—	White, red.	Orthoclase. Apatite.	In Granular Lime- stone, Gneiss, and Crystalline Schists.	5—6	2·54—2·76
—	Yellow to brown, grey.	—	—	5—5·5	2·9—2·95

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION XII.—
1.	NEPHELINE. $(\text{NaK})_8\text{Al}_8\text{Si}_9\text{O}_{34}$.	HEXAGONAL.	s. NEPHELITE. v. ELAEOLITE.
2.	SODALITE. $3\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot 2\text{NaCl}$.	REGULAR.	
3.	NOSEAN AND HAUYN. $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot \text{Na}_2\text{SO}_4$.	REGULAR.	s. NOSITE. s. HAÜYNITE.
4.	LAZURITE. p	REGULAR.	s. LAPIS LAZULI. s. ULTRAMARINE.
5.	LEUCITE. $\text{K}_2\text{Al}_2\text{Si}_4\text{O}_{12}$.	REGULAR AND RHOMBIC.	s. AMPHIGENE. s. WHITE GARNET.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
NEPHELINE GROUP.					
—	White, grey, bluish.	Apatite. Quartz. Cordierite.	—	5—6	2·6
} Isomorphic.	Colourless, blue	—	—	5—6	2·2—2·4
	Colourless, grey, green, black (Nosean); blue (Hauyn).	—	—	5—6	2·3—2·5
	Azure blue.	—	In Limestone.	5·5	2·38—2·42
—	White, grey.	Analcime.	—	5·5—6	2·45—2·5

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION XIII.—
1.	ORTHOCLASE. $K_2Al_2Si_6O_{16}$.	MONOCLINIC.	s. ORTHOSE. s. LEELITE. s. NECRONITE. v. ADULARIA (COLOURLESS). v. SANIDINE (WHITE GLASSY). v. AMAZON STONE (GREEN).
2.	MICROCLINE. $K_2Al_2Si_6O_{16}$.	TRICLINIC.	v. AMAZON STONE.
3.	ALBITE. $Na_2Al_2Si_6O_{16}$. [Ab_1An_0 to Ab_8An_1 .]	TRICLINIC.	s. SODA FELSPAR. s. CLEAVELANDITE. s. TETARTINE. s. TSCHERMAKITE.
4.	OLIGOCLASE. [Ab_6An_1 to Ab_2An_1 .]	TRICLINIC.	v. SUNSTONE.

PLAGIOCLASE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
FELSPAR GROUP.					
* —	Colourless, white, red, green.	Apatite. Scapolite. Andalusite. Triclinic Felspars.	Granite. Syenite. Porphyry. Trachyte. Gneiss.	6	2.53—2.58
} Triclinic Series.	Colourless, green.	Apatite. Scapolite. Andalusite. Triclinic Felspars.	Granite. Syenite. Porphyry. Trachyte. Gneiss.	6	2.57
	Colourless, white.	Orthoclase. Anorthite.	<i>Note—</i> $Ab = Na_2Al_2Si_6O_{16}$ $An = CaAl_2Si_2O_8$	6—7	2.6
	Colourless, white, greenish.	—	—	6	2.64

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION XIII.—			
5.	LABRADORITE. Ab_5An_6 to Ab_1An_3 .	TRICLINIC.	s. LABRADOR FELSPAR. s. CARNATITE. s. MAUILITE. s. MORNITE.
6.	ANORTHITE. $CaAl_2Si_2O_8$. [Ab_1An_8 to Ab_0An_1 .]	TRICLINIC.	s. CHRISTIANITE. s. SUNDVIKITE.
DIVISION XIV.—			
1.	APOPHYLLITE. $CaSi_2O_5 \cdot 2H_2O$.	TETRAGONAL.	v. OXHAVERITE. v. TESSELITE. v. ALBINE.
2.	ANALCIME. $Na_2Al_2Si_4O_{12} \cdot 2H_2O$.	REGULAR.	s. ANALCITE. s. PICRANALCIME. s. CUBICITE. s. CUBOITE. s. DORANITE. s. CLUTHALITE.

PLAGIOCLASE—continued.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
FELSPAR GROUP — <i>continued.</i>					
{ Triclinic Series— <i>continued.</i>	Colourless, white, blue.	—	Crystalline Schists.	6	2·69
	Colourless, white.	Orthoclase. Albite.	—	6	2·75
ZEOLITE GROUP.					
{ Natrolite Group.	Colourless, white, red.	—	—	4·5—5	2·3—2·4
	White, red.	Leucite.	—	5·5	2·1—2·3

NUMBER.	NAME AND COMPOSITION.	SYSTEM	SYNONYMS AND VARIETIES.
			DIVISION XIV.—
3.	NATROLITE. $\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10}\cdot 2\text{H}_2\text{O}.$	RHOMBIC AND MONOCLINIC.	s. SODA MESOTYPE. s. BREVICITE. v. MESOTYPE. v. MESOLITE. v. THOMSONITE. v. COMPTONITE.
4.	SCOLECITE. $\text{CaAl}_2\text{Si}_3\text{O}_{10}\cdot 3\text{H}_2\text{O}.$	MONOCLINIC.	s. LIME-MESOTYPE. v. POONAHILITE.
5.	PREHNITE. $\text{Ca}_2\text{Al}_2\text{Si}_3\text{O}_{11}\cdot \text{H}_2\text{O}.$	RHOMBIC.	s. JACKSONITE. s. CHILTONITE. v. COUPHOLITE.
6.	LAUMONTITE. $\text{CaAl}_2\text{Si}_4\text{O}_{12}\cdot 4\text{H}_2\text{O}.$	MONOCLINIC.	s. LAUMONITE. s. RETZITE. s. ÆDELFORSITE (RETZIUS).
7.	STILBITE. $\text{CaAl}_2\text{Si}_6\text{O}_{16}\cdot 5\text{H}_2\text{O}.$	MONOCLINIC.	s. HEULANDITE.

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION XIV.—
8.	DESMINE. $\text{CaAl}_2\text{Si}_6\text{O}_{16}\cdot 6\text{H}_2\text{O}.$	MONOCLINIC.	—
9.	PHILLIPSITE. $\text{CaAl}_2\text{Si}_4\text{O}_{12}\cdot 4\text{H}_2\text{O}.$	MONOCLINIC.	s. CHRISTIANITE (DES CLOIZEAUX).
10.	HARMATOME. $\text{BaAl}_2\text{Si}_5\text{O}_{14}\cdot 5\text{H}_2\text{O}.$	MONOCLINIC.	s. MORVENITE. s. BARYT-HARMATOME. s. ANDREOLITE. s. ANDREASBERGOLITE.
11.	CHABAZITE. $\text{CaAl}_2\text{Si}_4\text{O}_{12}\cdot 6\text{H}_2\text{O}.$	HEXAGONAL.	s. CHABASIE. v. PHACOLITE. v. HAYDENITE. v. ACADIALITE.

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION XV.—
1.	BIOTITE. $(\text{KH})_2(\text{MgFe})_2(\text{AlFe})_2$ Si_3O_{12} .	MONOCLINIC.	s. MAGNESIA-IRON MICA. s. EUCHLORITE. v. PHLOGOPITE. v. MEROXENE.
2.	ZINNWALDITE. $\text{F}_2(\text{LiK})_3\text{FeAl}_3\text{Si}_5\text{O}_{16}$.	MONOCLINIC.	LITHIA-IRON MICA.
3.	LEPIDOLITE. $\text{F}_2(\text{LiK})_2\text{Al}_2\text{Si}_3\text{O}_9$	MONOCLINIC.	s. LITHIONITE. s. LILALITE.
4.	MUSCOVITE. $\text{H}_4\text{K}_2\text{Al}_6\text{Si}_6\text{O}_{24}$.	MONOCLINIC.	s. POTASH MICA. s. PHENGITE. s. MARGARODITE.
5.	PARAGONITE. $\text{H}_4\text{Na}_2\text{Al}_6\text{Si}_6\text{O}_{24}$.	MONOCLINIC.	s. SODA-MICA. v. PREGRATTITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
MICA GROUP.					
—	Dark.	—	—	2·5—3	2·8—3·2
—	Pale violet, grey, brown.	—	In tinstone-bearing granites.	2—3	2·9—3·1
—	Rose red.	—	Minerals containing Fluorine.	2	2·8—2·9
—	Colourless, yellow, red, brown, green.	—	—	2—3	2·76—3·1
—	White apple green.	—	Staurolite. Disthene.	2—2·5	2·8—2·9

NUMBER.	NAME AND COMPOSITION.	SYSTEM,	SYNONYMS AND VARIETIES,
DIVISION XVI.—			
1.	MARGARITE. $H_4CaAl_4Si_2O_{12}$.	MONOCLINIC.	s. LIME-MICA. s. PEARL-MICA. s. CORUNDELLITE. s. CLINGMANITE. s. DIPHANITE. v. EMERYLITE.
DIVISION XVII.—			
1.	PROCHLORITE. At_7Sp_3 to At_3Sp_2 .	MONOCLINIC.	s. RIPIDOLITE (ROSE). s. CHLORITE (WERNER).
2.	CLINOCHLORE. At_3Sp_2 to $AtSp$.	MONOCLINIC.	s. RIPIDOLITE (KOBELL). s. CHLORITE (ROSE). s. GRASTITE.
3.	PENNITE. $AtSp$ to At_2Sp_3 .	MONOCLINIC.	s. PENNININE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
CLINTONITE GROUP.					
—	White, reddish.	—	Emerald.	3·5—4·5	3
CHLORITE GROUP.					
—	Green.	—	—	1	2·78—2·95
—	Blue to green.	—	Garnet. Diopside.	2	2·55—2·78
	Blue-green.	—	<i>Note—</i> At = $H_4Mg_2Al_2SiO_9$. Sp = $H_4Mg_3Si_2O_9$.	2·5	2·6—2·8

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION XVIII.—TALC,
1.	SERPENTINE. $H_4Mg_3Si_2O_9$.	p MONOCLINIC.	s. ROCHLANDITE. s. PORCELLOPHITE. s. BALTIMORITE. v. CHRYSOTILE. v. ANTIGORITE.
2.	MEERSCHAUM. $H_4Mg_2Si_3O_{10}$.	p	s. SEPIOLITE.
3.	TALC. $H_2Mg_3Si_4O_{12}$.	p MONOCLINIC.	s. POTSTONE. s. FIGURE STONE. v. SOAPSTONE. v. STEATITE.

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
OR SERPENTINE GROUP.					
* —	Green to black.	—	—	3—4	2·5—2·7
* —	White.	—	—	2—2·5	2
* —	Light green, white, grey, yellow, red.	—	—	1	2·7

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
DIVISION XIX.—			
1.	KAOLINITE. $H_4Al_2Si_2O_9$.	MONOCLINIC.	s. CHINA CLAY. s. KAOLIN. s. PORCELAIN EARTH. v. NACRITE (BREITHAUPT).
2.	PROPHYLLITE. $H_2Al_2Si_4O_{12}$.	ρ RHOMBIC.	—
DIVISION XX.—TITANATES,			
1.	PEROWSKITE. $CaTiO_3$.	ρ RHOMBIC.	s. PEROVSKITE. s. PEROFKITE.
2.	TITANITE. $CaTiSiO_5$.	MONOCLINIC.	s. SPHENE. s. PICTITE. s. TITANOMORPHITE. v. GREENOVITE. v. ALSHEDITE.

ISOMORPHIC GROUPING, &c.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
KAOLIN GROUP.					
* —	White, yellow, red, green.	—	—	1	2·2—2·6
—	Green to white.	—	In Granite.	1	2·7
ZIRCONATES, STANNATES.					
—	Black, brown, yellow.	--	—	5—6	3·95—4·1
—	Yellow, green, brown, red.	—	Albite. Adularia. Ripidolite.	5—5·5	3·4—3·6

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
<p style="text-align: right;">CLASS L.—ORGANIC</p> <p style="text-align: right;">DIVISION I.—SALTS</p>			
1.	<p>MELLITE.</p> $\text{Al}_2\text{C}_{12}\text{O}_{12}$	TETRAGONAL.	s. HONEYSTONE.
<p style="text-align: right;">DIVISION II.—</p>			
1.	<p>OZOKERITE.</p> C_nH_{2n}	—	v. PARAFFIN.
2.	<p>PETROLEUM.</p> C_nH_{2n}	—	<p>s. ROCK OIL.</p> <p>s. NAPHTHA.</p> <p>s. KEROSENE.</p>
<p style="text-align: right;">DIVISION III.—</p>			
1.	<p>AMBER.</p> $\text{C}_{40}\text{H}_{64}\text{O}_4$	AMORPHOUS.	s. SUCCINITE.
2.	<p>ASPHALT.</p> $\text{C},\text{H},\text{O}.$	AMORPHOUS.	<p>s. BITUMEN.</p> <p>s. MINERAL PITCH.</p>

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
COMPOUNDS.					
OF ORGANIC ACIDS.					
—	Yellow.	—	Lignite. Coal.	2—2·5	1·6
HYDROCARBONS.					
—	Green to brown.	—	Petroleum. Coal.	1	0·9
—	—	—	—	—	0·6—0·9
RESINS.					
—	Yellow.	—	—	2—2·5	1—1·1
—	Black	—	Limestone and Sandstone.	1—2	1·1—1·12

NUMBER.	NAME AND COMPOSITION.	SYSTEM.	SYNONYMS AND VARIETIES.
			DIVISION IV.—
1.	ANTHRACITE. C 90 per cent. H 2—2½ per cent.	—	s. MINERAL COAL. s. GLANCE COAL. s. STONE COAL.
2.	BLACK COAL. C 74—94 per cent. H 1—5 per cent.	—	Other Names according to Locality, Physical Differences, or Uses. v. JET.
3.	BROWN COAL. C 55—75 per cent. H 6—3 per cent.	—	s. LIGNITE. UMBER (EARTHY).
4.	PEAT. C 53—58 per cent. H 6—5 per cent.	—	—

ISOMORPHIC GROUPING, &C.	COLOUR.	SIMILAR MINERALS.	ASSOCIATED MINERALS.	HARDNESS.	SP. GR.
COAL.					
—	Black to iron grey.	—	—	2—2·5	1·4—1·7
—	Black-brown to grey.	—	—	2—2·5	1·2—1·5
—	Brown.	—	—	—	1·2—1·4
—	Brown, light yellow to dark.	—	—	—	—

ADDENDA.

The following minerals, owing to their commercial value, are here considered more in detail than was possible in the main portion of the catalogue :—

ORES.

Gold is almost without exception extracted from ores containing native gold, mechanically mixed with quartz or other similar rocks. It is usual to distinguish between alluvial gold and that found in granitic rocks. Amongst the rare gold ores may be mentioned Sylvanite, Nagyagite, Petzite, Maldonite. Gold is also obtained from Pyrites, Arsenical pyrites and Copper pyrites.

Silver, in spite of the small percentage found, is mainly extracted from Galena. Actual silver ores are : Native silver, Pyrargite, Proustite, Silver glance, Polybasite, Miargyrite, Antimony silver, Arsenical silver, Fahl ore, Bromite, Horn silver. The following are of rarer occurrence : Silver selenide, Silver telluride, Argyrodite.

Mercury. Seldom found native, generally obtained from Cinnabar ; also occurs in Fahl ore.

Copper. The most important copper ores are Native copper, Copper pyrites, Bornite, Fahl ore, Bournonite, Enargite, Cuprite, Malachite, Azurite, Atacamite. Of local and less importance are Copper vitriol and rarely Copper selenide, Tagilite, Olivenite, Euchroite, Volborthite, Liroconite, Dioptase.

Lead, chief ore Galena, of secondary importance Zincenite, Jamesonite, Boulangerite, Plagionite, Bournonite, Cerussite, Anglesite, Pyromorphite, Mimetesite, more rarely Leadhillite, Linarite, Crocite, Vanadinite.

Zinc. Calamine (carbonate and silicate), Zinc blende. Of local importance Franklinite, Zincite, rare Willemite, Troostite, Hopeite.

Cadmium. Silesian calamines and blends. Greenockite (CdS) is rare. Cadmium is used in alloys (such as Wood's metal), in colours, and for blue fire in pyrotechnics.

Tin. Cassiterite and Franckeite.

Iron. Spathic iron, Red and brown Hæmatite, Magnetic iron, and their varieties.

Manganese. The word Pyrolusite is technically applied to all or any of the following :—Pyrolusite proper, Polianite, Manganite, Hausmannite, Braunite, Psilomelane, Wad, Varvicite. Used in alloys as ferro-manganese, cupro-manganese and for the preparation of Chlorine.

Nickel. Most of the Nickel used for technical purposes is obtained from Garnierite and Magnetic pyrites containing Nickel.

Cobalt. From Magnetic pyrites containing Cobalt, Smaltine, Cobalt glance, less common Glaucodote, Linnæite, Cobalt spar. Used in the colour industry.

Arsenic. All Arsenic ores, Realgar and Orpiment are of only local importance, nearly always associated with silver. Used for the manufacture of oxide of Arsenic and other arsenical preparations, as mordant in cotton printing, in colours, for clearing glass, etc.

Antimony. Antimony glance, Senarmontite and others. Used for type metal, Britannia metal, and other alloys and also in Tartar emetic.

Bismuth. Bismuth glance and Bismuth-copper ores. Associated with Silver, Nickel, and Cobalt ores. Used in porcelain glaze, cosmetic powder, fusible alloys.

Aluminium. Bauxite, and to a less extent, Cryolite. Alums and soda obtained as secondary products.

JEWELS.

The value of jewels is based on their physical properties (hardness, transparency, colour, lustre, refractive power) and on the rarity of their occurrence. The names used by jewellers are often not identical with their mineralogical names.

Diamond. Generally in diluvial deposits. The characteristic minerals accompanying Diamonds are Gold, Platinum, Topaz, Chrysoberyl, Tourmaline, Garnet, Zircon, Rutile, Anatase, Tinstone, Quartz, Spinel, also in crystalline schists, especially Hornblende and Mica schists, in sandstones, and particularly in Olivine (Kimberlite) in Cape Colony. It has been found in meteorites. Used in jewellery and the coloured varieties for rock boring.

Corundum—Ruby, Sapphire. Those found in North-west Himalaya, Ava in Burmah, Syriam in Pegu, Ceylon, and especially those from Central Asia, are much used for ornament. Of less importance are the Sapphires from the Ural, North America, and New South Wales.

Spinel. A contact-mineral, in granular limestones, generally accompanies Rubies in Siam, Burmah, Ceylon, Turkestan, and New South Wales.

Beryl—Emerald, Aquamarine. Emerald usually in Mica schists. The finest specimens from Calcite veins near Santa Fé de Bogota. Aquamarine, usually in granite, from Ural, Nertschinsk, Elba, also in Burmah and Brazil.

Chrysoberyl. Yellow-green chrysoberyl (Chrysolite) from Brazil, Ceylon, and Further India. Dark Green (Alexandrite) from mines in Takowaja.

Euclase (Datolite group), in Brazil and Ural.

Phenakite (Willemite group), from Takowaja.

Topaz, in clay slates. From Minas Geraes, clear or pale green, in Ceylon clear or saffron yellow, in New South Wales, blue-green, in Colorado, colourless and cinnamon brown.

Zircon (Hyacinth). Only the red varieties are used in jewellery. Occurs in Ceylon, India, and New South Wales.

Garnet (Hessonite), from Ceylon.

Almandine, in Mica schists of Zillerthal, in Ceylon, Syriam in Pegu (Syrian Rubies), Brazil, North America, Vaal River (Cape Rubies), Pyrope (Bohemian Rubies). The green Demantoid occurs with Serpentine and Asbestos in Ural.

Olivine (Chrysolite). Ceylon, Pegu, Upper Nile, Brazil.

Tourmaline (Rubellite), Indigolite (Brazilian Sapphire), from Ural and Brazil, used for optical purposes.

Green Tourmaline (Brazilian Emerald), from Minas Geraes, and as Ceylon Chrysolite, from Brazil.

Opal in volcanic Breccia at Czerwenitz. Less fine in South Australia and Guatemala.

Turquoise (Oriental Turquoise). The sky blue varieties most valuable, in volcanic Breccias in Nischapur, Sinai, Arabia, also in vicinity of Santa Fé.

Lapis Lazuli. In limestones, Baikal lake.

Quartz—Rock Crystal, smoky Topaz, Citrine, Amethyst, Cat's-eye, Aventurine, Chalcedony, Onyx, Heliotrope, are all used for decorative purposes. Moonstone and Labradorite, varieties of Felspar, are also used for this purpose. Of more local importance are Vesuvian (brown from Vesuvius, green from Alasthal), Cordierite (Water-Sapphire), Andalusite, Cyanite, Staurolite, Axinite, Diopside, Hiddenite (Spodumene from North Carolina), Titanite.

Sulphur. Especially from South-west Sicily. Also from Croatia, Galicia, Pozzuoli, Corfu, Milo, Krisuvik in Iceland, Caucasus, Red Sea, Gulf of Suez.

Graphite, in crystalline slates. Siberia, Ceylon, Keswick (no longer worked), New York, California. Used for pencils, crucibles, and as a lubricant.

Asbestos. Under the name Asbestos are included all thread-like fire and acid-resisting varieties of Hornblende, Augite, and Serpentine. Technically, Tremolite Asbestos from Lombardy (Amiant) or Serpentine Asbestos (Chrysotile or Noble Asbestos) from Canada. Used extensively for fire and acid-proof materials and packing.

Apatite and Phosphorite. Largely used as manure, either directly as fine meal, or, more usually, as superphosphate. Potash Salts (also Glaucinite), Chilsaltpetre, Gypsum, Anhydrite, and Marls are used for the same purpose.

OTHER MINERALS OF INDUSTRIAL IMPORTANCE.

Fluor Spar, as a flux in metallurgical processes ; for manufacture of HF .

Strontianite, Celestine, Witherite, are all used in sugar extraction and in pyrotechnics.

Magnesite, in the manufacture of CO_2 , free from bitumenous matter for aerated waters.

Heavy Spar, as adulterant, "weighting" of a variety of materials.

Kieselguhr, as polishing material and as absorbent for explosives, for manufacture of soluble glass.

Felspar (Orthoclase), from Scandinavia, for porcelain and glass.

Kaolin. Pure varieties are used for porcelain (Meissen, Sevres, St. Austell in Cornwall). Less pure varieties in many localities for pipe clay, potters' clay (Wedgewood wares), for crucibles, &c.

Salt and Potash. Salt deposits found in all geological formations, *e.g.*, Silurian in New York, Devonian in St. Petersburg, Carboniferous in China, Permian in Bristol and Michigan, Trias in North Germany, Miocene in Wieliczka. The extent of salt deposits is often very great. A boring at Sperenberg, near Berlin, passes through 1,183 metres of salt without reaching the underlying formation. Anhydrite and Gypsum are invariably associated with rock salt. The salt deposits of North and Central Germany, on account of their extension and their enormous importance from an industrial and economical point of view, deserve special mention. These deposits are the only considerable source of the indispensable Potash salts. The salt-bearing layers, composed mainly of rock salt, Potash and Magnesia salts, together with Anhydrite and Gypsum, are usually divided into two portions—(1) "The old" rock salt, and (2) "The recent" rock salt. The basis of the old rock salt is Anhydrite. The following beds are easily distinguished :—

- (1) Anhydrite.
- (2) Polyhalite.
- (3) Kieserite.
- (4) Carnallite.

The last is the most important. Owing to secondary changes in some parts of the deposits, Kainite and Sylvine, sometimes pure, but often mixed (hard salt), are found. Above those mentioned, separated by layers of clay, Gypsum and Anhydrite, occurs the recent rock salt. This consists of extensive rock-salt deposits with lens-shaped masses of Anhydrite, Sylvine, Carnallite, and "Hard Salt." The uppermost layer consists of clays upon which the lower Bunter Sandstone rests.

The Potash salts, Kainite and Sylvine, are usually roughly ground and used directly as manure, but Carnallite and "Hard Salt" are separately treated. The KCl crystallizes out from the hot saturated solution, leaving the MgCl_2 behind. Kieserite is employed in the manufacture of MgSO_4 for cotton goods. Glauber salt is prepared by cooling solutions of Kieserite and rock salt below 0° ; it is used for

glass making. The MgCl_2 is employed in the manufacture of Hydrochloric Acid and Bromine. The greater part of the soda of commerce is a manufactured product: small quantities of natural soda are obtained from Lower Egypt, East Indies, Nevada, and Peru. Amongst many technical uses, those of soap and glass manufacture, in dyeing and washing may be mentioned.

Glauber Salt occurs in the same localities as soda, also in the Ebro valley and Tiflis. The greater part is manufactured from rock salt.

Chili Saltpetre, used for the manufacture of saltpetre, is not of common occurrence. The chief source is Tarapaca, in North Chili.

Alunite, used in the preparation of alum, is found in Italy, Islands of Greek Archipelago, Asia Minor, &c. The chief source is from clays and rocks containing Iron pyrites, Cryolite, and Bauxite.

Boracite, Tincal, and Sassoline, from which borax is obtained, are of technical importance. The chief localities are Tuscany and Sasso. Of recent years California and Nevada have produced large quantities of borax. Formerly all borax came from the neighbourhood of Tergri Nor, in Thibet.

Graphite, Heavy Spar, Chalk, Ochre are used in colours and other industrial products.

Bole, also for colours; that from Armenia being bright red, from Sinope dark red, from Lemnos and Silesia yellow red, from France pale red to yellow. Umber from Cyprus is also a Bole; that from Cologne or Cassel is a brown coal. The green earths from Verona and Cyprus are used for green colours. Malachite and Azurite find occasional use in the colour industry.

Marble. The finest qualities are obtained from Carrara, where two varieties are distinguished—the lighter coloured, “Chiaro,” and the darker, “Bardiglio.” The pure white quality of Chiaro, known as “Statuario” and the less-finely grained “Bianco Chiaro” are most highly prized for sculpture.

Alabaster. Fine qualities obtained from Tuscany, Sicily, and Montmartre, near Paris.

Serpentine is used for ornamental purposes. Obtained from Saxony and Tuscany.

Agalmatolite (from China), Malachite, Lazurite, Rhodonite, Chrysoprase, are similarly used.

Nephrite and Jadeite afforded material for prehistoric weapons.

